

## **Response to Information Request: September 26, 2012**

**Request Items A and B:** What is the date for these water level measurements? On Monday, September 24, 2012, Craig Holmes sent Stacey Dwyer a “sand B Summary Table” with water level data from 2008, 2010, and 2012. However, this data does not appear to match up for any of the years on the table. If this data is from another month of a year, please correct your table and add this data with the correct month and year. Please refer to Item B below for the Summary Table.

### **Reply to Items A and B**

The table that was hand delivered to William Honker by Craig Holmes at the EPA/UEC/TCEQ meeting in Austin on September 7, 2012 contains water level data for September 2008. The table is being provided again with this response and is titled “Response to Items A and B Table 1”. As explained in the following paragraphs, water level elevation differences between this table and the “Sand B Summary Table” (sent from Craig Holmes to Stacey Dwyer on 9-24-2012 (Item B)) are the result of using ground surface elevations from a more recent elevation survey and casing height measurements obtained on 9-19-2012.

A comparison of depth to water (“Water Levels, ft” column) in “Response to Items A and B Table 1” to September-08 depth to water (“Water Levels, TOC (ft)” column) in the “Sand B Summary Table” shows that depth to water is identical for the two tables. There are differences in water level elevations between the two tables because surface elevations and casing (CHAGS) heights changed as a result of more recent measurements.

Surface elevations were measured in 2008 and again in 2010. Five wells (BMW-7, BMW-8, BMW-9, PTW-1 and PTW-10) were re-surveyed on 9-19-2012 to verify the 2010 measurements, with a maximum difference of about four inches verifying the 2010 measurements. Surface elevations from 2008 were used for calculating water level elevations in the “Response to A and B Items Table 1” table since it was developed in 2008, prior to the 2010 survey. The “Sand B Summary Table” sent from Craig Holmes to Stacey Dwyer on 9-24-2012 (Item B) used the 2010 surface elevations. A significant survey error of approximately four feet at well BMW-7 was corrected in the 2010 survey.

Minor variances are common in GPS surveys. The GPS survey method used can be affected by several factors including number of satellites acquired, atmospheric disturbances, interference from terrestrial features (buildings, thickets, etc.), resulting in slightly different readings at different times. Ground settlement or heave in the disturbed area around a well casing could also contribute to a slight change in ground surface elevations over time.

Other than at well BMW-7, the maximum surface elevation change between the 2008 measurements and the 2010 measurements was only 7.1 inches. These minor variations in surface elevations between the two surveys provide verification of the accuracy of the measurements.

The casing height (CHAGS), which is the distance from ground surface to the top of casing, was measured in 2008, 2010 (some wells) and most recently on 9-19-2012. The 2008 table ("Response to Items A and B Table 1") used 2008 measurements for CHAGS since the new measurements were not available when it was created. The "Sand B Summary Table" used 2012 measurements for CHAGS. Well BMW-9 had a 2008 CHAGS value of 15.96 inches and a 2012 measurement of 28 inches, resulting in a difference of about one foot. It is likely that the 2008 measurement was 25.96 inches, but was entered incorrectly in the field data sheet. In other words, the casing was not physically altered. Other than for well BMW-9, the maximum CHAGS change between the 2008 measurements and the 2012 measurements was about 7.5 inches. As noted above, ground settlement or heave in the disturbed area around a well could change ground surface elevations slightly over time, thus changing the CHAGS values. The table, "Response to Items A and B Table 2", includes the 2008 and 2012 CHAGS values.

"Response to Items A and B Table 2" lists the water level elevations from both tables ("Response to Items A and B Table 1" and "Sand B Summary Table") and demonstrates that the differences are due to revised surface elevations and revised CHAGS heights. Water level differences exceeded 6 inches at only two wells and averaged about two inches (excluding BMW-7). Comparing the fourth column in the table, "Response to Items A and B Table 2", ("Water Level Elevation Differences") to the twelfth column ("Calculated Change due to Surface Elevation and CHAGS Differences") shows that the values are identical.

**Request Item C:** Please provide the date for the A-A' south fault cross-sections. I assume the cross-sections were based on data from a previous year (include both the date of the data and a date of generation for this cross-section). Email from Harry Anthony to Stacey Dwyer, et.al on September 14, 2012.

### **Reply to Item C**

The cross-section A-A' was created on September 13, 2012. The logs used to build the section were developed on the following dates:

32201-N183: 8/8/2007

32203-18: 4/27/1984

32203-30: 5/9/1984

32203-39: 5/11/1984

32203-45: 5/14/1984

32203-52: 5/16/1984

Surveys were conducted by the following personnel: Pavan Bairu (2008 survey); Carl Wentz and either Pavan Bairu, Aiguo Bian or James Gale (2010 survey); Carl Wentz (2012 survey); and Carl Wentz, Jon Pollock and Bob Underdown (September 2012 survey).

**Request Item D:** The contours do not exactly match the data that was submitted to EPA in the Summary Table (see item B above in this email). Please ensure that all the data that is in this graphic for February 2012 is reflected in the Summary Table.

#### **Reply to Item D**

The referenced contour plot (“February 2012 B-Sand (graben wells) Water Levels”) was developed using water level elevations calculated from 2008 ground surface elevations and 2010 casing height measurements. Water level elevations in the “Sand B Summary Table” (Item B) were calculated using the more recent 2010 ground surface elevations and casing height measurements obtained on 9-19-2012. As discussed in the following paragraphs, these differences and the exclusion of well PTW-14 explain why the contours do not exactly match the water level elevations in the “Sand B Summary Table” (Item B).

The attached table, titled “Response to Item D Table 1”, lists the water level elevations from the “Sand B Summary Table” (Item B) and those used to generate the (“February 2012 B-Sand (graben wells) Water Levels”) plot and demonstrates that the differences are due to revised surface elevations and revised CHAGS heights. Water level differences exceeded 6 inches at only three wells and averaged about two inches (excluding BMW-7). Comparing the fourth column in the table (“Water Level Elevation Differences”) to the twelfth column (“Calculated Change due to Surface Elevation and CHAGS Differences”) shows that the values are identical.

Surface elevations were measured in 2008 and again in 2010. Five wells (BMW-7, BMW-8, BMW-9, PTW-1 and PTW-10) were resurveyed on 9-19-2012 to verify the 2010 measurements, with a maximum difference of about four inches verifying the 2010 measurements. Old surface elevations from 2008 were inadvertently used for the “February 2012 B-Sand (graben wells) Water Levels” plot. The “Sand B Summary Table” (Item B) is based on the 2010 surface elevations. Other than for well BMW-7, the maximum surface elevation change between the 2008 measurements and the 2010 measurements was only 7.1 inches. These minor variations in surface elevations between the two surveys provide verification of the accuracy of the measurements.

The CHAGS height, which is the height of the top of casing above ground surface, was re-measured on 9-19-2012. The “February 2012 B-Sand (graben wells) Water Levels” plot used 2010 measurements for CHAGS since the new measurements were not available at that time.

Well BMW-9 had a 2010 CHAGS value of 15.96 inches and a 2012 measurement of 28 inches, resulting in a difference of about one foot. It is likely that the 2010 measurement should have been 25.96 inches, but was entered incorrectly in the field data sheet. Other than for well BMW-9, the maximum CHAGS change between the 2010 measurements and the 2012 measurements was only 5.4 inches.

Well PTW-14 was included in the “Sand B Summary Table” (Item B), but was not used for the “February 2012 B-Sand (graben wells) Water Levels” plot because INTERA was not aware at that time that well CBP-1 had been renamed PTW-14. Well survey information that INTERA had when the “February 2012 B-Sand (graben wells) Water Levels” plot was created included well CBP-1, but did not include an entry under the well name PTW-14. Well PT-BD was included for the “February 2012 B-Sand (graben wells) Water Levels” plot, but not in the “Sand B Summary Table” (Item B) because it is not part of the monitoring well network and was not resurveyed in 2010. PT-BD was installed specifically for the fault pump test.

**Request Item E:** I have the justification for disregarding BMW-7, but need a justification for all the data that was not considered. Please include the contractor’s name that took the water level data measurements.

#### **Reply to Item E**

Contour plots for the B Sand water level elevations were developed on 9-21-2012 for water levels collected in September 2008, March 2010, February 2012 and September 2012. Water level elevations used to create each of these plots were included in the Sand B Summary Table (Item B). All of the water levels in the Sand B Summary Table were used for the September 2008, February 2012 and September 2012 contour plots.

As will be discussed below, we excluded wells PTW-1, PTW-9 and PTW-10 from the March 2010 water level contour plot. Well BMW-7 is no longer considered an outlier since the 2010 well elevation resurvey identified a surface elevation error of over four feet for that well. The resurveyed elevation was verified on 9-19-2012. Water levels for well BMW-7 are included in all four contour plots.

We noticed a greater variability in the water level elevation changes from September 2008 to March 2010 than in water level elevation changes from September 2008 to February 2012. This casts doubt on the reliability of the March 2010 water levels as opposed to the 2008 and 2012 measurements. In the March 2010 measuring event, we noted that the water level elevations in PTW-1 and PTW-10 are several feet below those of any other wells sampled at that time. Conversely, the March 2010 water level elevation for well PTW-9 was almost a foot above the water level of any other well sampled at that time.

These results contrasted significantly from both prior and subsequent measuring events. For example, in the September 2008 event, water level elevations in PTW-1, PTW-9 and PTW-10

were 161.89, 161.91 and 161.48 feet, respectively. This compares quite consistently to the February 2012 measurements, which show water levels of 159.49, 159.56 and 159.10 feet. Because the earlier and later measurements are consistent, we believe that the February 2010 water level measurements do not provide an accurate picture of the water levels.